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**Datasheet for the decision
of 25 March 2009**

Case Number: T 0785/08 - 3.3.03

Application Number: 01309037.8

Publication Number: 1201692

IPC: C08F 265/02

Language of the proceedings: EN

Title of invention:

Processes for preparing impact modifier powders

Patentee:

ROHM AND HAAS COMPANY

Opponent:

BASF SE

Headword:

-

Relevant legal provisions:

EPC Art. 56

Relevant legal provisions (EPC 1973):

-

Keyword:

"Inventive step - problem and solution"

Decisions cited:

-

Catchword:

-



Case Number: T 0785/08 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 25 March 2009

Appellant: BASF SE
(Opponent) D-67056 Ludwigshafen (DE)

Representative: -

Respondent: ROHM AND HAAS COMPANY
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 30 January 2008
and posted 11 February 2008 rejecting the
opposition filed against European patent
No. 1201692 pursuant to Article 101(2) EPC.

Composition of the Board:

Chairman: R. Young
Members: W. Sieber
H. Preglauda

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 1 201 692, in respect of European patent application no. 01309037.8, in the name of Rohm and Haas Company, filed on 24 October 2001 and claiming a priority date of 25 October 2000 from US 243513, was published on 29 December 2004 (Bulletin 2004/53). The granted patent contained 10 claims whereby Claim 1 read as follows:

"A process for preparing a powdery impact modifier, comprising the steps of:

- (I) providing a polymer particle dispersion, said dispersion comprising:
 - (a) a first population of core-shell polymer particles, and
 - (b) a second population of core-shell polymer particles,

wherein the mean particle diameter of the first population of core-shell polymer particles is at least 50 percent larger than the mean particle diameter of the second population of core-shell polymer particles, and wherein the total rubbery weight fraction of the first and second populations of core-shell polymer particles is greater than 90 weight percent, and

(II) spray-drying the polymer particle dispersion."

Claims 2 to 10 were dependent claims directed to elaborations of the process of Claim 1.

- II. Notice of opposition was filed by BASF AG (now BASF SE) on 26 August 2005 requesting revocation of the patent in its entirety on the grounds of Article 100(a) EPC (lack of inventive step).

The opposition was based on the following documents:

D1: US 4 897 449 A; and

D2: US 4 278 576 A.

- III. By a decision which was announced orally on 30 January 2008 and issued in writing on 11 February 2008, the opposition division rejected the opposition.

According to the opposition division, D1 represented the closest prior art. The technical problem to be solved had to be seen in the provision of an effective and efficient isolation method at practical isolation rates for core-shell polymer based impact modifiers having a rubber phase content of greater than 90% by weight, wherein the final product was obtained in the form of a free-flowing powder employing a reduced amount (less than 7 %) of flow aid. Neither D1 alone nor the combination of D1 and D2 provided any hint how to solve the posed problem. All attempts to arrive at the claimed invention by using D1 or D2, taken alone or together, would be the result of a typical *ex post facto* analysis.

IV. On 21 April 2008, the appellant (opponent) filed a notice of appeal against the above decision with simultaneous payment of the prescribed fee and requested that the decision under appeal be set aside and the patent be revoked in its entirety. The statement of grounds of appeal was filed on 20 June 2008. The arguments presented therein may be summarized as follows:

D1 was the closest prior art because it belonged to the same technical field, ie the preparation of impact modifiers, and concerned the same technical problem, ie the improvement of the impact strength properties. In addition, D1 had most of the features in common with the claimed invention. The claimed process differed from the disclosure of D1 only in that the total rubbery weight fraction of the first and second populations of core-shell polymer particles was greater than 90 weight percent and in that the polymer particles were spray-dried in the presence of a flow aid in an amount of more than 1.5 percent by weight. Since increasing the amount of total rubber content in the polymer particles improved their impact strength property, the objective technical problem had to be seen in the provision of polymer particles with high rubber content for improved impact performance, and, at the same time, simple isolation of the polymer particles as free-flowing powder without the use of large amounts of flowing aid. Faced with this problem, the person skilled in the art would take the teaching of D2 into account which disclosed the preparation of impact modifiers containing polymer particles having monomodal particle populations and a rubber content of 60 to 100 weight percent. The impact modifiers

containing the polymer particles with a rubber content of 60 to 100 weight percent provided improved impact strength properties. Since, furthermore, the isolation of the polymer particles of D2 with a high rubber content was achieved by the addition of a large amount of a specific flow aid (0.5 to 50%), it was obvious for the skilled person, starting from D1 in combination with D2, to choose the amount of flow aid as high as possible thereby arriving at the subject-matter of dependant Claim 6 of the opposed patent.

Further, the appellant submitted experiments which allegedly were dispersions according to Examples I-III of D2 and showed that the particle population (monomodal or bimodal) had no influence on the impact strength properties or the isolation of the polymer particles.

- V. In its reply dated 21 October 2008, the respondent (proprietor) requested that the appeal be dismissed and pointed out that the statement of grounds of appeal did not introduce any new line of objection or argumentation which had not been previously considered by the opposition division in detail during the opposition procedure, which proceedings had resulted in the in the rejection of the opposition.

As regards the experiments provided by the appellant, these experiments were not a repeat of what was actually disclosed in D2. Further, the appellant did not say how it actually made the polymer powders so that the respondent was not in a position to repeat the experiments in order to verify the appellant's assertions. Indeed, without full details of the

appellant's worked examples, the respondent remained of the firm view that the appellant could not have made the alleged powders by simply following the teachings of D2. If a skilled person was to simply follow the teachings of D2, then they would not form the polymers of the appellant's worked examples. In view of the lack of disclosure regarding their preparation and the inconclusive nature of the results, the worked examples provided by the appellant in the statement of appeal could not be considered sufficient to discredit the inventive step of the claimed subject matter.

- VI. In a letter dated 15 December 2008, the appellant indicated that it would not participate in the oral proceedings scheduled for 13 January 2009.
- VII. In a facsimile received at the EPO on 13 January 2009 at 02:09:45, the representative of the respondent advised the board that it would be unable to attend the oral proceedings scheduled for that day due to events completely out of his control. He requested the board to either reject the appeal, or, if the board were inclined to revoke the patent, to postpone the oral proceedings to a new date to be arranged.
- VIII. On 13 January 2009, oral proceedings were held before the board where neither of the parties was represented. The board decided to continue the proceedings in writing.
- IX. In a communication, issued on 13 January 2009 accompanying a summons to further oral proceedings, the board expressed its doubts as to whether or not the process of Claim 1 as granted involved an inventive

step over D1 which was considered by the parties to represent the closest prior art.

X. In a letter dated 17 February 2009, the respondent pointed out that D1 did not disclose or suggest that the total rubber content should be more than 90 wt%. Actually, the teachings of the worked examples of D1 were to use a total soft polymer phase of significantly less than 90 wt%. But even if a person skilled in the art reading D1 did consider it obvious to try isolating a soft polymer phase interpolymer with a total rubber content above 90 wt% (which it did not), to achieve the solution provided by the claimed invention, the skilled person had to make two further selections: (i) the skilled person had to select a dispersion wherein the mean particle diameter of one of the polymer populations was at least 50 percent larger than the mean particle diameter of the other polymer population, and (ii) the skilled person had to select to spray dry the polymer particle dispersion. However, D1 failed to provide signposts for the skilled person to do so, let alone to do so in full expectation of obtaining a free flowing product having a rubber content above 90 wt%.

Further, the respondent filed an auxiliary claim set. Since the auxiliary request is not relevant to this decision, it will not be discussed in further detail.

XI. On 25 March 2009, oral proceedings were held before the board. The parties basically relied upon their written submissions.

It was the appellant's position that the claimed subject-matter was obvious over a combination of D1 and

D2, especially as there was nothing which would have prevented the skilled person from combining these documents.

With regard to the disclosure of D1, the respondent considered that the difference of the claimed subject-matter over the disclosure of D1 had to be seen not only in the higher amount of total rubber content. In fact, additional selections from the disclosure of D1 had to be made in order to provide the solution provided by the claimed invention.

The appellant acknowledged that the difficulties associated with isolating high rubber content particles were generally known. However, with regard to this problem, D2 suggested to add higher amounts of flow aid. In this connection, the respondent pointed out that the presence of a flow aid was not a requirement of the claimed process. Examples 4-12 of the patent specification clearly demonstrated that a free-flowing impact modifier powder could be obtained without a flow aid. The presence of a flow aid merely provided the additional benefit of compaction free powders.

XII. The appellant requested that the decision under appeal be set aside and the patent be revoked in its entirety.

The respondent requested that the appeal be dismissed, or, in the alternative, that the decision under appeal be set aside and the patent be maintained on the basis of the auxiliary request (Claims 1-10) filed with the letter dated 17 February 2009.

Reasons for the Decision

1. The appeal is admissible.

Main request

In the present case only inventive step is at issue.

2. *Problem and solution*

- 2.1 The claimed process is directed to the preparation of a powdery impact modifier based on core-shell polymer particles having a high rubber content. Although it is a notorious desideratum in this field that the weight ratio of the rubbery phase to the hard phase in these core-shell polymer particles is as high as possible to make the impact modifier as efficient as possible at improving the impact strength (paragraph [0003] of the patent specification), the isolation of such particles, in particular by spray drying, is difficult. In this connection, paragraph [0004] of the patent specification states: "These problems include: (1) sticking of the particles to the chamber walls of the spray dryer; (2) bridging of the particles over conveying lines entrances; and (3) unacceptable powder flow characterized by characterized by aggregation, clumping, and flow interruptions".

- 2.2 Both parties and the opposition division considered D1 as representing the closest prior art.

D1 discloses impact modifiers composed of a multilayer composite interpolymer, ie core-shell polymer particles, whereby the polymerized product has (1) a population of

particles whose mean diameter is between approximately 40 and 150 nm, and (2) a population of particles whose mean diameter is between approximately 160 and 500 nm (column 2, lines 39-48). The interpolymer obtained may be isolated by coagulation or spray-drying (column 6, lines 14-15). In the case of a morphology with two layers of the soft-hard type, the inner and outer phases may, in particular, represent, respectively, 0.5 to 90 parts by weight and 99.5 to 10 parts by weight, per 100 parts by weight of the interpolymer of each population (column 3, lines 23-27). In the case of a morphology with three layers of the soft-soft-hard type, the first, second and third phases may, in particular, represent, respectively, 3 to 80 parts by weight, 10 to 60 parts by weight and 10 to 60 parts by weight, per 100 parts by weight of the interpolymer of each population (column 3, lines 28-33). It is conspicuous to the board that D1 does not disclose that both polymer populations of those embodiments should each contain the maximum amount of soft phase polymer. It simply discloses that the soft polymer phase in each polymer population of two specific embodiments can be in the range of from 0.5 to 90 wt% or 40 to 90 wt%, respectively. Nevertheless, D1 provides for the possibility of a maximum total rubbery weight fraction of 90 wt% when both populations are selected to contain the maximum amount of soft phase polymer. However, it should also be noted that in the soft-hard type embodiment it is equally possible for the amount of soft polymer phase to total 0.5 wt%, and in the soft-soft-hard type embodiment it is equally possible for the amount of soft polymer phases to total 40 wt%. Thus, the general disclosure of D1 is not particularly concerned with impact modifiers having a high rubber

content at all. In particular, where any guidance may arguably be found in D1, in the worked examples of D1, none of Examples 2 to 7 contain more than about 44.3% total rubbery phase (the approximate amount of the elastomeric phases as a percentage of the total weight of the polymers produced in these examples can be calculated from Table I of D1).

Thus, whilst D1 does not address the same problem as presented in the patent in suit, namely the isolation of core-shell impact modifiers having a high rubber content, D1 may be, as pointed out by the parties, the closest prior art as it can be considered to be the most similar disclosure in terms of technical features.

2.3 In the present case, it appears to be common ground that the isolation of core-shell particles with a high rubber content was a generally known problem in this field. This was not disputed by the appellant at the oral proceedings. Thus, the objective technical problem over D1 is in fact the problem that is described in the patent in suit, namely the provision of a process for preparing an impact modifier having a rubber content of greater than 90 weight percent and having good powder flow characteristics.

The patent in suit suggests as a solution to this technical problem the process of Claim 1 as granted which comprises as essential features

- two populations of core-shell polymer particles having a rubber content greater than 90 wt%,
- mean particle diameter of the two populations differs by at least 50 percent,
- spray drying.

In Examples 4 to 12 of the patent in suit dispersions meeting the requirements set out in Claim 1 as granted were spray dried without flow aid and resulted in a free flowing powder. Thus, the board is satisfied that the above identified technical problem is solved.

3. *Inventive step*

It remains to be decided if the proposed solution is obvious from the prior art.

3.1 As set out in point 2.2 above, D1 itself is not particularly concerned with the isolation of core-shell particles having a rubber content above about 44.3 wt%, let alone above 90 wt%. Thus, the person skilled in the art trying to solve the objective problem had no reason to go beyond the teaching of D1 in the first place.

But even if a person skilled in the art reading D1 would consider going beyond the teaching of that document and try to isolate polymer particles with a total rubbery content above 90 wt%, the claimed process is still not obvious from D1. As apparent from the above detailed analysis of D1, the difference between D1 and the claimed process lies not only in the higher total rubber content. In this regard, the appellant has taken a too simplified view of the disclosure of D1 versus the claimed subject-matter. In order to achieve the solution provided by Claim 1 as granted, the person skilled in the art not only has to go beyond the theoretical maximum rubber content disclosed in D1, the person skilled in the art must make two further selections from the disclosure of D1: (i) the skilled

person has to select a dispersion wherein the mean particle diameter of one of the polymer populations is at least 50 percent larger than the mean particle diameter of the other polymer population, and (ii) the skilled person has to select to spray dry the polymer particle dispersion.

With regard to the selection of the mean particle diameter, D1 discloses that the mean diameter of one population is in the range 40-150 nm and the other is 160-500 nm. Whilst there is a possibility by selection that the requirement of the mean particle diameter of one population is at least 50% larger than the other population, this possibility is not an unequivocal selection (eg one population could have a mean particle diameter of 150 nm and the other a mean particle diameter of 160 nm – this embodiment is outside the scope of the claims as granted). It must be recognised that it is quite possible for the skilled person to select mean particle diameters such that the mean particle diameter of one population is not larger than 50% of the other population. With regard to the spray drying of the polymer dispersion, D1 generally discloses that the polymers are isolated by coagulation or spray drying without expressing a preference (column 6, lines 14-15). It is only in the worked examples that a preference to spray drying is disclosed (column 8, lines 51-52: "The polymer is isolated by coagulation or, preferably, by spray drying."), but that disclosure is specifically with regard to the particular polymers formed in Examples 1 to 8, none of which are core-shell polymers wherein the total rubbery phase is above 44.3 wt%, and in any case the worked examples do not in fact disclose which of coagulation

or spray drying was actually employed to isolate the polymers. Hence, D1 fails to provide clear signposts for a skilled person that a specific bimodal character (ie mean particle diameter of one population is at least 50% larger than the other population) **in association** with spray drying is essential for providing free-flowing impact modifiers with a high rubber content.

In summary, in order to arrive at the claimed subject-matter, the skilled person not only would have to go beyond the theoretical maximum of 90 wt% for the total rubbery weight content in D1, the skilled person would have further to make at least two selections in the teachings of D1 (1. a selection to use core-shell polymers wherein the mean particle diameter of one population is at least 50 % larger than the other population, 2. a selection to use spray drying). However, without any signposts to do so, let alone to do so in full expectation of obtaining a free-flowing impact modifier with a high rubber content, it is evident that the claimed subject matter is not obvious from D1.

- 3.2 The claimed process is also not obvious over a combination of D1 with D2 as argued by the appellant.
- 3.2.1 D2 relates to a method of isolating impact modifier polymers as powders comprising introducing about 0.5 to 50% by weight of stearate coated calcium carbonate after formation of the polymers but before or during isolation of the powders (Claim 1). The resultant powders have improved anti-compaction properties as well as powder flow. The impact modifiers which are

isolated in accordance with the process of D2 are methacrylate-butadiene-styrene graft polymers, acrylic core-shell polymers, or analogues of these wherein the rubber content may be from 60 to 100% of the total polymeric material (column 2, lines 20-28). The isolation method can be spray drying, coagulation, grinding or other known methods (column 2, lines 38-39). D2 even exemplifies impact modifiers having a high rubber content. In Example XXXIV, an acrylic core-shell particle having a rubbery core of 88 wt% of the total weight was prepared. While the polymer was extremely tacky and unable to be isolated by spray drying, the product could be isolated as a free flowing powder when Winnofil[®] S (stearate coated calcium carbonate) was fed into the inlet air stream at approximately 7%.

First of all it should be mentioned that D2 does not disclose bimodal populations of the polymer particles, but only describes and exemplifies monomodal systems. Quite apart from this it is conspicuous to the board that the "invention" of D2 lies in the use of a specific flow agent in order to obtain free-flowing impact modifier powders. Furthermore, when considering Example XXXIV of D2, which discloses that a (monomodal) core-shell polymer containing 88 wt% rubber core requires 7 wt% of flow aid, a person skilled in the art would expect that a core-shell polymer with a higher rubber content than 88 wt% would require a higher amount of flow aid to form a free-flowing powder. However, the addition of a flow aid may be a solution to the above defined objective technical problem (ie the provision of impact modifiers having a rubber content of greater than 90 wt% and having good powder flow characteristics), but it is not **the** solution

suggested by the claimed process, namely spray drying of two populations of core-shell polymer particles whereby the mean particle diameter of the two populations differs by at least 50 percent. The presence of a flow aid is not part of the claimed process. As can be seen from Examples 4 to 12 in the patent in suit, the objective technical problem is indeed solved in the absence of a flow aid. The dispersions prepared in these examples were spray dryable without flow aid to free-flowing powders. A flow aid may be additionally present in the claimed process to further improve the compaction properties of the powders (paragraph [0059] of the patent specification), but the addition of the flow aid is not an essential feature of the claimed process. Therefore, the appellant's argument that the flow aid would be necessary to get free-flowing powders is not valid.

3.2.2 Thus, apart from confirming the notorious desideratum of having the weight ratio of the rubbery phase to the hard phase in impact modifiers based on core-shell particles as high as possible (see point 2.1 above), D2 cannot contribute anything to make the claimed process obvious. Moreover, it appears that the appellant's combination of D1 and D2 is the result of an *ex post facto* analysis where elements of D1 (bimodal, specific ratio of mean diameter, spray drying) were combined with elements of D2 (high rubber content) although there was no incentive for a person skilled to concentrate on these elements, especially in D1, in order to solve the posed problem.

3.2.3 In summary, there was no incentive for the person skilled in the art to combine different text passages

of D1 with elements of D2 in order to solve the objective technical problem. Thus, the process of Claims 1-10 as granted is not obvious from D1 in combination with D2.

- 3.3 The appellant provided worked examples in the statement of grounds of appeal which allegedly were representative of dispersions disclosed in D2 and showed that a person skilled in the art would apply the teaching of D2 to D1 despite the fact that D2 disclosed only monomodal polymer particles. However, the appellant's worked examples cannot be considered sufficient to discredit the above finding on inventive step for the following reasons.

Firstly, these worked examples are actually not a repeat of what is disclosed in D2. The respondent even argued that the appellant's worked examples appeared to be based upon a fanciful extrapolation of D2 which employed *ex post facto* analysis of the patent. Secondly, it is conspicuous to the board that all the worked examples contain a rather high amount of calcium carbonate (5 wt%) which is likely to conceal the benefits of the claimed invention. As set out in point 3.2.1 above, the addition of a flow aid is not the "invention" of the claimed process. Thirdly, there is, as pointed out by the respondent, a lack of disclosure regarding the preparation of the appellant's examples which gives rise to doubts as to whether or not the alleged powders could have been made by simply following the teaching of D2. Finally, the nature of the results appears to be inconclusive. The results of the Notched Impact Strength tests appear to be insufficiently precise for any skilled person to be

able to make any conclusions regarding whether or not the powders do or do not have different impact strengths.

- 3.4 In summary, the subject-matter of Claim 1, and by the same token, the subject-matter of dependent Claims 2-10, is based on an inventive step.
4. Under these circumstances there was no need to discuss the respondent's auxiliary request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young